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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/781,803	02/20/2004	Nabila Baba-Ali	1857.1670001	5186

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EXAMINER

CHACKO DAVIS, DABORAH

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 03/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/781,803

Applicant(s)

BABA-ALI ET AL.

Examiner

Daborah Chacko-Davis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Amendment filed on 12/28/2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 and 27-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-25 and 27-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-4, 6-7, 9-15, 17-19, 21-31, are rejected under 35 U.S.C. 103(a) as being unpatentable U. S. Patent No. 5,541,026 (Matsumoto) in view of U. S. Patent No. 6,404,482 (Shiraishi).

Matsumoto, in the abstract, in col 2, lines 60-67, in col 3, lines 1-64, in col 7, lines 14-67, in col 8, lines 1-9, and in col 11, lines 10-27, discloses an optical system used in a method of transferring an image onto a wafer comprising performing an exposure on a wafer (wafer coated with photoresist (negative or positive) layer) with polarized light beams, wherein the light (unpolarized illumination source) emitted from the light source is polarized by a polarizing means (pattern polarizing device); the light beams traverse an optical path (optical axis direction aligned with the focus of the projection optics) and are transmitted in a predetermined direction through a phase-shift mask in a predetermined pattern (image pattern, polarization pattern) to form a circuit pattern on the wafer (printing on wafer) (claims 1, 7, 11-15, 17-19, 27). Matsumoto, in col 10, lines 33-48, discloses that the polarized light can be projected through any polarizing means (any dimension, custom polarization pattern) to produce an image (pattern) with high-contrast (claims 4, 24, and 31). Matsumoto, in col 3, lines 1-10, and lines 36-49,

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discloses that the projection system emits polarized light during exposure (claim 6).

Matsumoto, in col 12, lines 5-28, in col 16, lines 59-67, and in col 17, lines 1-12,

discloses that the exposure can be performed through either an attenuating phase-shifting mask, or an alternating phase-shifting mask or a chromeless phase-shifting

mask (the dark portions are formed on the mask without using any light-shielding film on it) (claims 9, 25, 28). Matsumoto, in col 12, lines 5-26, discloses that certain portions of

the phase-shift mask are dark portions (with light shielding film on the dark portions) and certain portions are light transmitting portion (binary mask) (claim 10). Matsumoto, in

col 3, lines 1-5, discloses that the pattern polarizing means is included in projection optical system (pupil plane of the projection optics) (claim 21).

The difference between the claims and Matsumoto, is that Matsumoto does not disclose that the exposure beam is polarized prior to impinging the mask (illuminating the mask with a pre-polarized light). Matsumoto does not disclose that the polarized light is projected in a radial illumination mode through the phase-shift mask (claims 2, 22, and 29). Matsumoto does not disclose that the polarized light is transmitted in a tangential illumination mode through the phase-shift mask (claims 3, 23, and 30).

Matsumoto does not disclose forming contact hole patterns with a pitch.

Shiraishi, in col 10, lines 7-24, in col 11, lines 27-67, in col 13, lines 36-49, in col 14, lines 1-30, discloses that the reticle is illuminated with a pre-polarized light, and that the polarized light is either radially or tangentially polarized. Shiraishi, in col 11, lines 27-46, disclose forming contact hole patterns (has a pitch, since plural contact holes are formed).

Therefore, it would be obvious to a skilled artisan to modify Matsumoto by employing the method of polarizing the light prior to exposure through the mask as taught by Shiraishi, because Shiraishi, in col 15, lines 9-20, disclose that pre-polarizing light prior to mask exposure avoids absorption of exposure energy, and suppresses thermal accumulation in the projection optical system. It would be obvious to a skilled artisan to modify Matsumoto by using either of the polarized beams (radial or tangential) for exposure as taught by Shiraishi, because Shiraishi, in col 15, lines 57-61, discloses that by employing a linearly polarized light, the illumination beam can be converted into two temporally incoherent beams in the optical system and enable the reduction of speckle or interference fringes.

3. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,541,026 (Matsumoto) in view of U. S. Patent No. 6,404,482 (Shiraishi) as applied to claims 1-4, 6-7, 9-15, 17-19, 21-31, above, and further in view of U. S. Patent Application Publication No. 2002/0176166 (Schuster).

Matsumoto in view of Shiraishi is discussed in paragraph no. 2.

The difference between the claims and Matsumoto is that Matsumoto does not disclose that the polarizer produces a polarized light that is in a quadrupole illumination mode (claim 5).

Schuster, in [0053], discloses that the polarizer in the illumination system projects a quadrupole illumination mode to perform an exposure.

Therefore, it would be obvious to a skilled artisan to modify Matsumoto by employing the illumination mode suggested by Schuster because Schuster in [0053],

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discloses that selecting such an illumination mode results in a large, sharply defined and highly homogenous illuminating field.

4. Claims 8, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,541,026 (Matsumoto) in view of U. S. Patent No. 6,404,482 (Shiraishi) as applied to claims 1-4, 6-7, 9-15, 17-19, 21-31, above, and further in view of U. S. Patent No. 5,539,514 (Shishido et al).

Matsumoto in view of Shirashi is discussed in paragraph no. 2.

The difference between the claims and Matsumoto is that Matsumoto does not disclose that a liquid is filling a space between the projection optic and the wafer to perform an exposure through a liquid path (claims 8, and 20).

Shishido, in col 29, lines 19-21, and in figure 61, discloses that liquid means can be provided in the optical path length of the illuminating unit.

Therefore, it would be obvious to a skilled artisan to modify Matsumoto by employing a liquid means in the optical path length of the projection system as suggested by Shishido because Shishido, in col 29, lines 14-24, discloses that providing liquid means in the projection path length enables the provision of optical path correcting units that are deformable or are capable of continuously changing the optical path length.

5. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,541,026 (Matsumoto) in view of U. S. Patent No. 6,404,482 (Shiraishi) as

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applied to claims 1-4, 6-7, 9-15, 17-19, 21-31, above, and further in view of U. S. Patent No. 5,467,166 (Shiraishi).

Matsumoto in view of Shiraishi is discussed in paragraph no. 2.

The difference between the claims and Matsumoto is that Matsumoto does not disclose that the polarizing device is a waveplate (claim 16).

Shiraishi, in col 14, lines 11-37, discloses that the polarizing member (polarizing device) is either a half wavelength plate or a quarter wavelength plate.

Therefore, it would be obvious to as skilled artisan to modify Matsumoto by employing the wavelength plates suggested by Shiraishi because Shiraishi, in col 12, lines 53-67, and in col 13, lines 1-19, discloses that using wavelength plates as the polarizing member results in the projection of polarized beams that do not interfere with each other at the wafer interface (during exposure), such that the individually polarized beams (non-interfering) are amplitude-combined and form images (intensity distribution) with increased depth of focus.

Response to Arguments

6. Applicant's arguments, see Remarks, filed 12/28/2004, with respect to claim 1-4, 6-7, 9-15, 17-19, 21-31, have been considered but are moot in view of the new ground(s) of rejection.

A) Applicants argue that Matsumoto is directed to a polarizing photomask, and that Matsumoto does not teach illuminating a mask with a polarized beam.

See paragraph no. 2.

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Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd



March 21, 2005.



**JOHN A. MCPHERSON
PRIMARY EXAMINER**